

microdialysis probe which acts as an adjuster to regulate the starting content of glucose in the perfusate are proposed to achieve this object.--.

In the Claims

Please cancel claims 1-22 without prejudice or disclaimer of the subject matter claimed therein.

Please add new claims 23-67 as follows:

23. A method for determining the glucose concentration in a body fluid with glucose-containing perfusate, the method comprising the steps of:
providing a microdialysis probe, a measurement cell, and a control device,
inserting the microdialysis probe into the body fluid,
passing the perfusate having a starting content of glucose through the microdialysis probe to obtain a dialysate,
transporting the dialysate to the measuring cell,
measuring measurement signals that correlate with the glucose content of the dialysate, and

adjusting the starting content of glucose in the perfusate to the glucose content of the body fluid with the control device in accordance with a command variable derived from the measurement signals of the measuring cell.

24. The method of claim 23 wherein the adjusting step includes determining a momentary starting content of the glucose in the perfusate as a measure for the glucose content of the body fluid when a deviation of a controlled variable from the command variable is negligible.

25. The method of claim 24 wherein the control unit includes an adjuster having an adjusting variable and the adjusting step includes determining the starting content of glucose in the perfusate from the adjusting variable.

26. The method of claim 23 wherein the control unit includes an adjuster having an adjusting variable and the adjusting step includes determining the starting content of glucose in the perfusate from the adjusting variable.

27. The method of claim 23 further comprising the step of measuring the glucose content of the perfusate before it is passed into the microdialysis probe.

28. The method of claim 24 further comprising the step of measuring the glucose content of the perfusate before it is passed into the microdialysis probe.

29. The method of claim 26 further comprising the step of measuring the glucose content of the perfusate before it is passed into the microdialysis probe.

30. The method of claim 23 further comprising the step of flow mixing two perfusion liquids with different glucose concentrations provided in two separate reservoirs to influence the starting content of glucose in the perfusate.

31. The method of claim 24 further comprising the step of flow mixing two perfusion liquids with different glucose concentrations provided in two separate reservoirs to influence the starting content of glucose in the perfusate.

32. The method of claim 27 further comprising the step of flow mixing two perfusion liquids with different glucose concentrations provided in two separate reservoirs to influence the starting content of glucose in the perfusate.

33. The method of claim 23 wherein the perfusate is passed through the microdialysis probe in alternating successive transport and dialysis intervals at different flow rates, the flow rate during the transport intervals being higher than during the dialysis intervals.

34. The method of claim 24 wherein the perfusate is passed through the microdialysis probe in alternating successive transport and dialysis intervals at different flow rates, the flow rate during the transport intervals being higher than during the dialysis intervals.

35. The method of claim 27 wherein the perfusate is passed through the microdialysis probe in alternating successive transport and dialysis intervals at different flow rates, the flow rate during the transport intervals being higher than during the dialysis intervals.

36. The method of claim 30 wherein the perfusate is passed through the microdialysis probe in alternating successive transport and dialysis intervals at different flow rates, the flow rate during the transport intervals being higher than during the dialysis intervals.

37. The method of claim 33 wherein the flow rate during the transport intervals is increased to such an extent that the starting content of glucose in the perfusate during passage through the microdialysis probe remains essentially constant and that during the dialysis intervals the transport is interrupted or at least the flow rate is reduced to such an extent that the glucose concentration of the dialysate approximates the glucose content of the body fluid.

38. The method of claim 23 wherein the command variable is determined by integration or differentiation of the time course of the measurement signals.

39. The method of claim 24 wherein the command variable is determined by integration or differentiation of the time course of the measurement signals.

40. The method of claim 27 wherein the command variable is determined by integration or differentiation of the time course of the measurement signals.

41. The method of claim 30 wherein the command variable is determined by integration or differentiation of the time course of the measurement signals.

42. The method of claim 33 wherein the command variable is determined by integration or differentiation of the time course of the measurement signals.

43. The method of claim 38 wherein the command variable is determined by qualitative detection of signal peaks in the time course of the measurement signals.

44. The method of claim 33 wherein the command variable is determined by comparing the actual signal curve of the measurement signals with calibrated signal patterns deposited in a storage medium.

45. The method of claim 38 wherein the command variable is determined by comparing the actual signal curve of the measurement signals with calibrated signal patterns deposited in a storage medium.

46. The method of claim 33 wherein the command variable is determined from the peak value of the signal time course of the measurement signals during each transport interval.

47. The method of claim 38 wherein the command variable is determined from the peak value of the signal time course of the measurement signals during each transport interval.

48. The method of claim 33 wherein the command variable is determined according to the glucose content c of the body fluid according to the relationship

$$c = \left[\frac{S_g}{S_g \cdot (1 - b) + b \cdot S_0} - 1 \right] \cdot a \cdot c_0 + c_0$$

in which S_g denotes the peak value and S_0 denotes the base line value of the signals measured during a transport interval and c_0 is the momentary starting content of glucose in the perfusate and a, b are empirically determined correction factors compensating for diffusion and mixing and remaining recovery effects during the transport interval.

49. The method of claim 38 wherein the command variable is determined according to the glucose content c of the body fluid according to the relationship

$$c = \left[\frac{S_g}{S_g \cdot (1 - b) + b \cdot S_0} - 1 \right] \cdot a \cdot c_0 + c_0$$

in which S_g denotes the peak value and S_0 denotes the base line value of the signals measured during a transport interval and c_0 is the momentary starting content of glucose in the perfusate and a, b are empirically determined correction factors compensating for diffusion and mixing and remaining recovery effects during the transport interval.

50. The method of claim 23 further comprising the step of regulating discontinuously the starting content of glucose in the perfusate by a two-point control process in which the starting content of glucose in the perfusate is changed by a predetermined adjustment value when there is a control deviation.

51. An arrangement for determining the glucose concentration in a body fluid, the arrangement comprising

a microdialysis probe formed for a diffusion exchange of glucose with surrounding body fluid,

a perfusion device formed to perfuse the microdialysis probe with glucose-containing perfusate to obtain a dialysate,

a measuring cell located after the microdialysis probe, the cell being formed to detect measurement signals that correlate with the glucose content of the dialysate, and

a control device that adjusts the starting content of glucose in the perfusate to the glucose content of the body fluid in accordance with a command variable derived from the measurement signals of the measuring cell.

52. The arrangement of claim 51 further comprising an evaluation unit formed to determine the momentary starting content of glucose in the perfusate when the control deviation is negligible as a measure for the glucose content of the body fluid.

53. The arrangement as claimed in claim 52 wherein the perfusion device has a perfusate store and a transport unit that is formed for the intermittent transport of perfusate.

54. The arrangement as claimed in claim 51 wherein the perfusion device has a perfusate store and a transport unit that is formed for the intermittent transport of perfusate.

55. The arrangement as claimed in claim 54 wherein the perfusate store has at least two separate reservoirs to hold perfusion liquids with different glucose concentrations.

56. The arrangement as claimed in claim 54 wherein the perfusate store has a first reservoir containing a glucose-free perfusion liquid and a second reservoir containing a glucose-containing perfusion liquid.

57. The arrangement as claimed in claim 54 wherein the control device has a flow mixer that includes a valve formed to adjust the starting content of the glucose in the perfusate.

58. The arrangement as claimed in claim 51 wherein the control device has a flow mixer that includes a valve formed to adjust the starting content of the glucose in the perfusate.

59. The arrangement as claimed in claim 58 wherein the valve is mixing valve or a clock-pulsed directional control valve.

60. The arrangement as claimed in claim 52 wherein the control device has a flow mixer that includes a valve formed to adjust the starting content of the glucose in the perfusate.

61. The arrangement as claimed in claim 58 wherein the flow mixer includes an inlet side connected to reservoirs for feeding in perfusion fluids with different glucose contents and an outlet side connected to a perfusate tube leading to the microdialysis probe.

62. The arrangement as claimed in claim 58 wherein the control device has a digitally operated controller.

63. The arrangement as claimed in claim 51 wherein the control device has a digitally operated controller.

64. The arrangement as claimed in claim 63 wherein the controller is a microcontroller.

65. The arrangement as claimed in claim 52 wherein the control device has a digitally operated controller.

66. The arrangement as claimed in claim 54 wherein the control device has a digitally operated controller.